A CONSTRUCTIVIST APPROACH TO TEACHING SYSTEMS ANALYSIS AND DESIGN: AN EMPIRICAL STUDY

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ABSTRACT

Learning and the transfer of learning are central to understanding how students develop competencies. Several features have strong effect on the transfer of learning. Most of these features including direct experience, common elements among similar cases, contrasting cases and multiple contexts, frequent feedback, and reciprocal teaching all are present in structured walkthroughs. In this study an experimental static-group comparison design was used to investigate the effect of the conducting walkthroughs on student learning. It was concluded that structured walkthroughs do have positive results on learning and broadening the student's knowledge base by exposing them to information created in a new learning environment.

INTRODUCTION

Constructivist Theory

Many educators are increasingly moving towards adopting a learner-centered approach to teaching. (Quintana et al., 1999). They view learning as an active process of discovery and participation in which the teacher is seen as a guide, facilitating the learning process (Sfard, 1998). The theory of constructivism is at the core of this movement. According to constructivism, learning is a dynamic process in which the learner actively "constructs" new knowledge as he or she is engaged in a learning activity.

Constructivism claim that learning occurs not by absorbing information but by interpreting it. Effective learning depends on the internal processes of the learner, who must construct his or her own knowledge. Learning occurs not by absorbing information but by interpreting it (Resnick, p. 2). Constructivism proposes that meaning is constructed by individuals through their experiences in particular contexts. The context for learning and the activities of the learner affect how something is understood, and therefore, what is learned (Honebein et al., 1993).

In the classroom, the constructivist view of learning can point towards a number of different teaching practices. In the most general sense, it usually means encouraging students to use active techniques like experiments and real-world problem solving to create more knowledge and then to reflect on and talk about what they are doing and how their understanding is changing.

Situated Learning

The theory of situated (or situational) learning emerged as an application of the constructivist epistemology to the learning process. According to this theory knowledge is situated, being a product of the activity, context, and culture in which it is developed and used [1]. Learning occurs via the exposure to and participation in an environment in which the knowledge is practiced. Two approaches have been developed as applications of situated learning theory in teaching practice: anchored instruction and

cognitive apprenticeship. Anchored instruction is based on the following principles [9, 10, 11]:

1 Learning and teaching activities should be designed around an "anchor" and they should be presented in an authentic context.
2 Encourage social interaction and collaboration.

Structured Walkthrough Approach

Here we suggest a combination of Lecture/Structured Walkthroughs learning environment based on recommendations mentioned earlier by constructivist and situated learning researchers which includes the elements of both anchored instruction and cognitive apprenticeship.

A structured walkthrough primary role is to situate the learners in a learning environment by giving examples of real-world situations and demonstrating their relevance to concepts and methods of systems analysis and design. A structured walkthrough include model solutions for development of information systems and plays a role similar to the role of anchors in situated learning [9, 1]. It prompts the learners' participation by requesting them to perform certain actions and to make certain decisions in walkthrough sessions. In a structured walkthrough, scaffolding is to be provided by giving feedback and hints of possible solutions by the instructor and participating students. For learners, a structured walkthrough together with a successful solution is a representation of the domain knowledge. Real world cases should be chosen to expose the domain from a variety of points of view, thus achieving multiple representations. Finally, the CASE tools offer students the tools necessary to experiment with the drawing Data Flow Diagrams and repository (domain) concepts. The most important role of the CASE tool is to provide access to comprehensive and systematic coverage of information relating to the real world projects.

Data and Research Design

In this study an experimental static-group comparison design was used to investigate the effect of the conducting walkthroughs on transfer of knowledge and student learning. Students from four consecutive yearly offerings of the same course in the systems analysis & design were assigned to a control group and a treatment group. Students in the control group received traditional lectures and exercises. Students in the treatment group received traditional lectures and participated in the structured walkthroughs. Both groups were taught by the same instructor. To test for equivalency of the background preparations of the two groups, the GPA of the students for four prerequisite courses were examined. The t-test (.79) indicated that there was no difference between the two groups at 5 percent level of significance.
The null hypothesis states that there are no significant differences in the mean test scores for the structured walk-through group and the mean test scores for the controlled group. The alternative hypothesis states that there are significant differences between the two groups. The 95.1 % Confidence Interval (CI) for the difference between the two medians ranges fro 3 to 6. Minitab reports a test result of 2231.5 and a p-value of 0.00, so we can reject the null hypothesis at 0.05 level of significance ($p<.05$). In other words, we may conclude that there is a significant difference between the two groups in terms of their test scores.

Concluding Remarks

Learning and the transfer of learning is an important research topic for improving quality of education. In response to this challenge, academic institutions are trying to develop new techniques and teaching tools to make learning more effective and efficient.

Structured walkthroughs, designed according to constructivist principles, incorporate several features like direct experience, examination of similar cases and contrasting cases in multiple contexts, frequent feedback, and reciprocal teaching that have strong effect on learning.

In this paper the results of an experimental study was reported by comparing the broadcast instructor-led teaching method with the structured walkthrough teaching method. An inference was made that using structured walkthroughs in a learning environment may result in higher test scores as compared to using traditional lecture-based environment. It was concluded that structured walkthroughs do have positive results in transfer of learning and broadening the students' knowledge base by exposing them to information created in a situated learning environment.

Selection of the subjects is the main limitation of this study. I used the static-group design to investigate the effects of using structured walkthroughs on students' performance. This design had restricted the sample size to 41 students in each group. In addition, the assignment of students to treatment and control groups was non-random. I tested for equivalency of the background preparations of the two groups using the GPA of the students for four prerequisite courses. The t-test indicated that there was no difference between the two groups at 5 percent level of significance. Nevertheless, the t-test does not insure that treatment and control groups were equivalent. Future studies should address this concern and use larger and randomly selected groups to test the effect of structured walkthroughs on learning.

References available upon request.